January 29, 2002

VIA FEDEX AND FAX
The Honorable Michael Powell
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: ET Docket 98-153, In the Matter of Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems

Dear Chairman Powell:

CAN A GPS RECEIVER WORK AT ALL WITH UWB?

The problem with UWB is that UWB can preclude a GPS receiver from **ever** locking up on the GPS satellites. This means that an individual seeking to be located via GPS may never be found. If UWB results **in just one** such incident, then blame is securely on the FCC.

Previous test reports have centered on the effect UWB has on already locked-up GPS receivers...**and the effect is monumental**. UWB can cause an already locked up receiver to lose lock. UWB can cause the indicated location to be off by hundreds of meters. For this reason alone there should be no UWB energy radiated in the GPS band.

Worse yet is the fact that most GPS receivers will be off when an accident or other incident occurs. This is because battery drain on any handheld unit is too great to keep the GPS receiver on all the time.

With the GPS receiver off and then turned on, it must be able to detect GPS signals at -150 dBm. (Uncorrelated GPS signals arrive at the earth at -150 dBm). If interfering signals are above -150 dBm, the GPS receiver when turned on **will not lock up**. Thus with UWB there are instances when the GPS receiver will **never** be able to output position.

Even if the GPS receiver eventually locks up, say for instance in 10 minutes, this is clearly too long in rescue scenarios since someone can bleed to death in eight minutes.

Now we have a test from Qualcomm that quantifies the problem.

ANALYSIS OF THE QUALCOMM UWB INTERFERENCE TEST

Analysis of the Qualcomm UWB Interference Test indicates 44% of the time GPS receivers will fail to lock up because only 2 satellites are visible. Here there were 21 instances out of 48 total tries in which **only 2 satellites** were detectable in the presence of UWB radiation. GPS receivers need **at least 3 satellites** to lock up and give position. Thus UWB makes GPS receivers fail 44% of the time.

If the utilization of UWB prohibits transmission of only one injured party's location, UWB should not be authorized. The FCC's analysis should not be a "numbers game" in which there are an acceptable number of failures for a GPS receiver to lock up in the presence of UWB interference.

There is no justification to jam GPS in the hope that some as-yet unproven technology would benefit. Also, even if there were a benefit, it pales into insignificance for E-911 rescue.

For the FCC to play a numbers game with human lives is unacceptable.

The FCC should mandate that there should be **no** interference with the receipt of GPS signals, either by limiting UWB usage to frequencies above the GPS frequency band or by using frequency hopping techniques common in spread spectrum systems to avoid GPS frequencies.

It is the position of this petitioner that no amount of filtering of UWB signals can guarantee **zero** interference with GPS, as there are no known filters that will decrease the output of a UWB device to -150 dBm. This is an absolute requirement for a GPS receiver to work.

Alternatively, this presenter **petitions the Commission to delay hearings** on UWB until after appropriate testing has been completed to assure that whatever will be authorized by the FCC will not affect the ability of a GPS receiver to lock up on the satellites and will not affect the critical time to first fix for any GPS receiver.

BACKGROUND

Tendler Cellular opposes any change to part 15 which would enable unlicensed authorization of Ultra Wide Band (UWB) because its use could and **would result in GPS receivers failing to lock up to GPS satellites**. This conclusion is supported by at least the test conducted by Qualcomm, which has been submitted to the FCC. Additionally, even if the use of UWB does not cause the GPS receiver to fail to lock up, interference has been shown to delay time to first fix for GPS receivers, thus significantly delaying the report of position to Public Safety Answering Points (PSAPs). In either case, UWB authorization constitutes an unjustifiable risk in the E-911 arena to public safety. The same also applies to military and aeronautical applications.

UWB AND E-911

The following remarks are presented by Tendler Cellular, Inc., the developer of the FoneFinder® system, which is the first company to embed an autonomous GPS receiver in a wireless handset. The FoneFinder system reports to Public Safety Answering Points (PSAPs) the location of a stricken individual. In order to conserve battery power the GPS unit is turned off until

it is required to report position. This means that when there is an accident or other emergency condition the GPS receiver must acquire the GPS satellites quickly, e.g., it must have a rapid time to first fix. These comments are an addendum to comments filed June 27, 2001 (attached.)

THE FRAGILE NATURE OF GPS

It has been found over the 5 years of testing that time to first fix is materially affected by interference. Typically for most autonomous GPS receivers, for a hot start in which the receiver has been locked onto the satellites and then the power is turned off for no more than 2 hours (so that the stored ephemeris is not stale) it has taken 9 seconds to acquire the satellites. For one autonomous GPS receiver it takes 1 second. However, in the presence of interference, **the GPS receiver may never lock up**.

From a public safety point of view signal acquisition must be done fast. It takes only 8 minutes to die from a severed artery. EMTs must get location information within seconds, not minutes in order to be able to rescue an individual.

As an example in Massachusetts, State Trooper Marc Chardineer was wounded in a routine traffic stop on Route 3 south of Boston. He couldn't report his position and by the time fellow officers arrived he was dead of blood loss. Time makes a difference.

It is true that given enough time for signal integration (hours or days) and without interference one can finally get a satellite fix in areas where there is no direct line of sight to the satellites such as in buildings.

Add interference of any kind and the situation often deteriorates **so that a fix is never obtained.**

Given the fragile nature of GPS and given that in some hostile environments no GPS lock is possible, **any** additional interference makes a difficult situation intolerable.

INTEFERENCE LEVELS

The problem arises because uncorrelated the GPS signal strength at the surface of the earth is -150 dBm. The noise floor is -160 dBm. In short, when a GPS receiver is turned on it must detect an infinitesimally small signal.

Note, regulations drafted in the '50s and even international regulations do not provide protection for GPS. Early regulations specified that if the interfering signal was 40 dB down there would be no effect on GPS. This is obviously not correct in view of the fact that the uncorrelated GPS signals are 150 dB down. It goes without saying that a signal at -40 dBm will jam a signal at -150dBm. The same is true for the applicable international regulations. What this means is that there is **NO tolerable level of interfering signal** (unless the signal is no greater that -150 dBm).

TESTING

With the exception of the testing done by Qualcomm, none of the reported test results has taken the real life approach of measuring the time to first fix for receivers that are off at the time of

need and are then turned on to see how long it takes for the receiver to lock up on the satellites and report position. This is the ultimate test of whether UWB will interfere with E-911.

Secondly there has been no testing of time to first fix for marginal situations. Open air tests with unobstructed views of the satellites do not address real life concerns such as situations where there is blockage by foliage or only partial satellite views due to the presence of tall blocking buildings.

Thirdly it makes no sense to base a UWB test on the best GPS receiver available. Rather a run of the mill standard GPS receiver such as those used by the Hertz Neverlost® system or OnStar® should be used. It is noted that Qualcomm uses an assisted GPS and still cannot get satellite lock in the presence of UWB interference. What does this mean for unassisted GPS receivers?

If a test indicates that there is **any scenario** in which satellite lock cannot be achieved, then it can be assumed that such a situation will occur again.

It is the undersigned's position that there is no level of "acceptable" interference unless that level is below -150 dBm. -150 dBm cannot be tested directly. The best indirect test is to measure time to first fix in a hot start situation. If the time to first fix is elongated in the presence of UWB, then use of UWB should be disallowed. Such has already happened in the Qualcomm test.

CONCLUSION

GPS is an imperfect system, but for many real life scenarios works relatively well for public safety purposes.

There is absolutely no justification for anyone jamming GPS. Moreover, there are no known filters or marks which will reduce UWB radiation to -150dBm. Once the Genie is out of the bottle it is our view that it can never be stuffed back in.

One questions what will be the case when just one individual in need can't be located and dies because his GPS receiver can't lock up on the satellites due to UWB. And it will happen. All tests so far indicate it will.

Respectfully Submitted,

Tendler Cellular, Inc.
Robert K. Tendler, Chairman

cc: Kathleen Q. Abernathy, Commissioner
Michael J. Copps, Commissioner
Kevin J. Martin, Commissioner